

COMMENTARY

Next step for reducing seabird bycatch

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doi:10.1111/acv.12041

The threat from incidental mortality of seabirds during fishing operations to the long-term viability of many seabird populations, especially those of albatrosses and petrels, has received much attention in recent decades (Anderson *et al.*, 2011; Brothers *et al.*, 1999). However, uncertainties in the reliability of estimates of bycatch rates and seabird mortality remain. In addition to recent work on this topic (Jiménez *et al.*, 2009, 2010; Tuck *et al.*, 2011), Yeh *et al.* (2013) demonstrate another useful approach based on observer data, which can be applied to regions other than the study area and coordinated with data from different fishing fleets and areas.

The lack of bycatch data provided by fishing fleets means that observer programs currently are the most useful and appropriate way to obtain accurate seabird data. Taiwan has many vessels operating in high latitudes where there is a high density of seabirds, and collecting seabird bycatch data is one of the major tasks for Taiwanese scientific observers (Huang, 2011). Many studies on the interaction of fishing fleets with seabirds are based on the overlap of seabird distribution from remote tracking data and the effort distribution of fisheries (e.g., Cuthbert *et al.*, 2005). However, Inoue *et al.* (2012) have shown that the distributions of seabirds from tracking data and that of seabird interaction index do not always agree with that of seabird bycatch rate. Lack of sufficient tracking data and seasonal differences in seabird distribution data are two possible causes for this disagreement. *In situ* observers can provide sighting data on seabird abundance in the study season and location, which can give a good supplemental index for seabird abundance. Yeh *et al.* (2013) have statistically demonstrated that sighting data are significantly related to seabird bycatch rate. Aggregating all the sighting data and integrating this information with tracking data can provide a broader picture of seabird distribution worldwide. It will be greatly beneficial if this approach could be applied to more fleets to achieve broader coverage of spatiotemporal distribution data.

Fishers do not like incidental catch of seabirds because it causes losses of bait, which increases operational costs. Many mitigation initiatives have been implemented as conservation and management measures for tuna by the Regional Fisheries Management Organizations (RFMOs), such as installation of bird-scaring lines (tori line), use of heavy weighted lead lines and setting lines at night. Most

Taiwanese longline vessels, especially those spending more time fishing in temperate waters, have adopted such measures to avoid bycatch of seabirds. These practices are expected to further reduce the bycatch rate of seabirds, and should be considered in the analyzing models.

There are two additional major considerations: a standard protocol and the technique of species identification. International cooperation, particularly cooperation under the framework of RFMOs could provide a means to meet these needs. More accurate estimates of seabird mortality can only be made available by acquiring data from all the fleets operating in the range.

As indicated by Yeh *et al.* (2013), few countries have developed observer programs relating to seabirds and provided bycatch data. Presumably, insufficient submissions of bycatch data by fishermen and concerns about an overinterpretation from already low availability of data are the major reasons. Currently, most estimations were made at country level rather than regional level. To solve such a problem of low availability of data in the regional level, international cooperation is needed. It might be advisable to have small research groups on seabird research within the scientific committees of the RFMOs, with initial members from scientists of members with country-based bycatch data in hand, and then gradually expanding to larger groups. Such research, in a globally coherent framework, may improve the effectiveness of the existing mitigation measures.

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